Amendments to the Claims

Please cancel claims 2, 16, and 47 without prejudice.

This listing of the claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently amended): A method for designing a coil, comprising:

selecting a geometry for the coil;

selecting a region of interest for a magnetic field produced by the coil;

defining a stream function for the current density distribution of the coil, wherein the stream function is a sum of sinusoidal functions, wherein each sinusoidal function comprises an amplitude, and wherein the stream function is defined as follows:

$$S(x,y) = \sum_i A_i \sin(\frac{i.\pi x}{a}).\sum_j B_j \sin(\frac{j.\pi y}{b})/(i.j)$$

where A_i and B_j are Fourier coefficients representing the amplitudes of the sinusoidal functions in the x and y directions, respectively, and a and b are dimensions of the coil in the x and y directions, respectively; and

numerically optimizing the amplitudes of the sinusoidal functions to produce a magnetic field of selected characteristics in the region of interest.

2. (Cancelled)

3. (Original): The method of claim 1, wherein numerically optimizing the amplitudes of the sinusoidal functions comprises:

selecting an amplitude for each of the sinusoidal functions;

generating a plurality of current loops from the stream function for the selected geometry;

dividing the current loops into a plurality of elements;

calculating the magnetic field produced by the plurality of elements at a plurality of points in the region of interest; and

evaluating an error function based on the magnetic field at the plurality of points.

4. (Original): The method of claim 1, wherein numerically optimizing the current density comprises simulated annealing.

5. (Original): The method of claim 1, wherein the selected geometry for the coil comprises an open geometry.

6. (Original): The method of claim 1, wherein the selected geometry for the coil comprises a substantially half cylindrical shell.

7. (Original): The method of claim 1, wherein the coil comprises a gradient coil, wherein the selected characteristics comprise homogeneity of a gradient in a longitudinal direction relative to a main magnetic field.

8. (Original): The method of claim 1, wherein the coil comprises a gradient coil, wherein the selected characteristics comprise homogeneity of a gradient in a transverse direction relative to a main magnetic field.

9. (Original): The method of claim 1, further comprising modeling the selected geometry for the coil a three-dimensional modeling program.

10. (Original): The method of claim 1, wherein the amplitudes of the sinusoidal functions are controlled to produce a symmetric coil.

11. (Original): The method of claim 1, wherein the amplitudes of the sinusoidal functions are controlled to produce an asymmetric coil.

12. (Original): A coil designed using the method of claim 1.

Claims 13-14 (Cancelled).

15. (Currently amended): A method of designing a coil comprising:

selecting an open geometry for the coil, wherein the selected geometry comprises a substantially half cylindrical shell;

selecting a region of interest for a field produced by the coil;

defining a current density distribution for the coil; and

numerically optimizing the current density distribution to produce a field of selected characteristics in the region of interest.

16. (Cancelled)

17. (Original): The method of claim 15, wherein numerically optimizing the current density comprises simulated annealing.

Claims 18-19 (Cancelled).

20. (Original): The method of claim 15, further comprising modeling the selected geometry for the coil a three-dimensional modeling program.

Claims 21-44 (Cancelled).

45. (Currently amended): A coil comprising an open geometry and configured to produce a magnetic field of selected characteristics in a region of interest, wherein at least one of the selected characteristics of the magnetic field is produced by numerically optimizing amplitudes of a plurality of sinusoidal functions, wherein a sum of the plurality of sinusoidal functions comprises a stream function for the current density distribution of the coil, wherein the stream function is defined as follows:

$$S(x,y) = \sum_i A_i \sin(\frac{i.\pi x}{a}).\sum_j B_j \sin(\frac{j.\pi y}{b})/(i.j)$$

where A_i and B_j are Fourier coefficients representing the amplitudes of the sinusoidal functions in the x and y directions, respectively, and a and b are dimensions of the coil in the x and y directions, respectively.

46. (Previously presented): The coil of claim 45, wherein a sum of the plurality of sinusoidal functions comprises a stream function for the current density distribution of the coil.

47. (Cancelled)

48. (Currently amended): The coil of claim 45, wherein the coil is ~~configurable~~ configured for use in magnetic resonance imaging.

49. (Previously presented): The coil of claim 45, wherein the coil is configurable for use in transcranial magnetic stimulation.

50. (New): A coil comprising a half cylindrical shell geometry and configured to produce a magnetic field of selected characteristics in a region of interest, wherein at least one of the selected characteristics of the magnetic field is produced by numerically optimizing amplitudes of a plurality of sinusoidal functions.